

REMARKS

Claims 1-56 have been rejected. By way of this Reply, claims 1, 3-4, 7-8, 10-11, 14-15, 17-18, 21-22, 24-25, 28-29, 31-32, 35-36, 38-39, 42-43, 45-50, 52-53, and 55-56 are amended, claims 2, 9, 16, 23, 30, 37, 44, and 51 are canceled, and claims 57-71 are newly added.

A. Claim Rejections Under 35 U.S.C. § 112, First Paragraph

Claims 1-49 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description and enablement requirements. The Examiner asserted that the Specification does not provide sufficient discussion or guidance as to: (1) the possible or desirable modes of administration for the various ailments encompassed; (2) the dosages used; (3) specific disease conditions which can be treated by the claimed agent; and (4) which types of cyanobacteria are compatible with the present invention.

With regards to the § 112 rejections that the Specification does not provide sufficient discussion or guidance as to which types of cyanobacteria are compatible with the present invention, claims 1-56 have been amended to indicate that the claimed compositions are proteoglycan extracts from *Spirulina*.

With regards to the § 112 rejections that the Specification does not provide sufficient discussion or guidance as to the possible or desirable modes of administration for the various ailments encompassed, Applicants respectfully assert

that the mode of administration for a particular ailment should be apparent to one skilled in the art. Furthermore, the written description and enablement requirements do not require such specificity. *See In re Curtis*, 354 F.3d 1347, 1352 (Fed. Cir. 2004) (*citing Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1479 (Fed. Cir. 1998) (“to fulfill the written description requirement, the patent specification must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.”)); *CFMT, Inc. v. Yieldup International Corp.*, 349 F.3d 1333, 1338 (Fed. Cir. 2003) (*citing Engel Industries, Inc. v. Lockformer Co.*, 946 F.2d 1528, 1533 (Fed. Cir. 1991) (“the enablement requirement is met if the description enables any mode of making and using the claimed invention.”)).

Applicants also traverse the Examiner’s rejections claiming that the Specification does not provide specific discussion or sufficient guidance as to the dosages used or the specific disease conditions which can be treated by the claimed agent. These § 112 rejections are addressed in detail as set forth below.

1. *Claims 1-7*

Claims 1-7, as amended, are generally directed to an anticancer composition comprising a proteoglycan extract from *Spirulina*. The results of using various amounts of the claimed composition to inhibit various tumor cell lines and cancer

propagating agents are discussed at pages 6-12 of the Specification, and summarized as follows:

- 1) Experiment 1 discloses the IC₅₀ values of fourteen (14) specific human tumor cell lines upon treatment with various concentrations of the claimed composition *in vitro*. It is recognized in the art that the IC₅₀ value of a candidate compound on tumor cell lines is commonly used to show the anti-tumor activity of the compound. *See* Specification at pgs. 7-8.
- 2) Experiment 2 discusses the effective amount of the claimed composition to inhibit topoisomerase I and topoisomerase II. "Topo I and Topo II have been identified as extensive targets of chemotherapeutic drugs in clinic." *See* Specification at pgs. 8-10 and Figures 2 and 3.
- 3) Experiment 3 discloses the effective concentration of the claimed composition to inhibit protein tyrosine kinase. "Protein tyrosine kinase ... is associated with the growth, proliferation and transformation of a cell." *See* Specification at pgs. 10-11.
- 4) Experiment 4 provides effective concentrations of the claimed compound for inducing apoptosis of human leukemia cells *s in vitro*. This experiment clearly demonstrates that concentrations of 1 mg/ml, 3 mg/ml, and 6 mg/ml of the claimed composition significantly induce apoptosis of human leukemia cells. *See* Specification at pgs. 11-12 and Figures 4 and 5.

Thus, the data provided on pages 6-12 of the Specification specifically discloses the effective concentrations or amounts of the claimed composition to permit one of skill in the art recognize and practice the cancer inhibiting function of the claimed invention.

Because these tumor cell lines and cancer propagating agents are known to have cancerous effects, Applicants assert that it is not necessary to specifically disclose the diseases that result from such cell lines and cancer propagating agents. However, it should be apparent to one of skill in the art that the claimed composition can be used to treat cancers such as human leukemia, lung cancer hepatoma and gastric adenocarcinoma. Moreover, there are many diseases having the specified clinical symptoms which may be treated by the claimed composition; therefore, it should not be necessary to list all of the applicable cancers.

2. *Claims 8-14*

Claims 8-14, as amended, are generally directed to a hemogram-improving composition comprising a proteoglycan extract from *Spirulina*. The results of using specific amounts of the claimed composition to improve hematopoietic function are discussed at pages 5-6 of the Specification, and summarized as follows:

- 1) Experiment 1 discloses that separate test groups of irradiated mice were administered with specific doses of the claimed composition. The test groups were designated as: (1) irradiated control group; (2) lower dose group (10 mg/Kg/day); (3) middle dose group (20 mg/Kg/day); and (4) high dose group (40 mg/Kg/day). The results listed in the Table on pg. 5 of the Specification show the hemogram improving effects of the lower, middle, and higher dose groups over the irradiation control group. *See Specification at pg. 5 and Figure 1.*
- 2) Experiment 2 discloses how the administration of the claimed composition to human patients suffering from radiation damage increased the number of leukocytes in the patients. *See Specification at pgs. 5-6.*

- 3) Experiment 3 discloses that after daily oral administration of the claimed composition to human patients having low levels of leukocytes and blood platelets, the levels of leukocytes and blood platelets increased in 73% of the patients tested, and other physical conditions such as diet, rest, and mental health improved. *See Specification at pg. 6.*
- 4) Experiment 4 discloses that after oral administration of the claimed composition to radiated dogs at a daily dosage of 360 mg for 24 days, the amount of blood platelets, medullary macroneucleocytes, marrow macroneucleocytes, and peripheral blood lymphocytes were higher in the treated groups of dogs. *See Specification at pg. 6.*

The results provided on pages 5-6 of the Specification specifically disclose sufficient data for one of ordinary skill in the art to recognize the hematopoietic improving function of the claimed composition.

3. *Claims 15-21*

Claims 15-21, as amended, are generally directed to an anti-irradiation composition comprising a proteoglycan extract from *Spirulina*. The Specification discloses that separate test groups of irradiated mice were administered with specific doses of the claimed composition. The test groups were designated as: (1) irradiated control group; (2) lower dose group (10 mg/kg/day); (3) middle dose group (20 mg/kg/day); and (4) high dose group (40 mg/kg/day). The results prove that the survival rates of mice in each of the three test groups were significantly higher than mice in the irradiated control group; thus, exhibiting the anti-irradiation activity of the claimed invention. *See Specification at page 4.*

4. Claims 22-28

Claims 22-28, as amended, are generally directed to a DNA-repairing composition comprising a proteoglycan extract from *Spirulina*. The results of using specific amounts of the claimed composition as a DNA-repairing agent are discussed at pages 12-13 of the Specification, and are summarized as follows:

- 1) Experiment 1 discloses that separate test groups of irradiated mice were administered with specific doses of the claimed composition. The test groups were designated as: (1) irradiated control group; (2) lower dose group (10 mg/kg/day); (3) middle dose group (20 mg/kg/day); and (4) high dose group (40 mg/kg/day). The results listed in the Table on pg. 12 of the Specification show that at the second day after radiation, the bone marrow damage to the treated test groups was significantly lower than that of the irradiated control group. *See Specification at pg. 12 and Figure 6.*
- 2) Experiment 2 discloses that the same test groups of irradiated mice from Experiment 1 were tested at the sixth day after radiation to determine the bone marrow DNA content of the test groups. The results listed in the Table on page 13 of the Specification show that the DNA content in each of the treated groups was significantly higher than that of the radiated control group. *See Specification at pgs. 12-13 and Figure 7.*

The results provided on pages 12-13 of the Specification specifically disclose sufficient data to demonstrate that the claimed composition protected bone marrow cells from radiation, and had obviously had a DNA repairing effect. Therefore, one of ordinary skill in the art would be able to recognize the DNA-repairing function of the claimed composition.

5. *Claims 29-35*

Claims 29-35, as amended, are generally directed to an antivirus composition comprising a proteoglycan extract from *Spirulina*. Page 13 of the Specification specifically describes the antiviral effects of the claimed composition on human patients suffering from the hepatitis virus.

6. *Claims 36-42*

Claims 36-42, as amended, are generally directed to an immunoenhancing composition comprising a proteoglycan extract from *Spirulina*. The results of using specific amounts of the claimed composition as an immunoenhancing agent are discussed at pages 14-15 of the Specification. Specifically, experiment 1 discloses that separate test groups of irradiated mice were administered with specific doses of the claimed composition. The test groups were designated as: (1) radiated control group; and (2) radiated treated group. The results listed in the Table on pg. 14 of the Specification show that γ -globulin percentage of mice in the radiated control group were significantly higher than the γ -globulin percentage of mice in the radiated control group. See Specification at pg. 14 and Figure 8. Since the content of γ -globulin represents immune function in the body these results demonstrate the immune enhancing capabilities of the claimed composition.

7. *Claims 43-49*

Claims 43-49, as amended, are generally directed to a dendrite-like cell-activating composition comprising a proteoglycan extract from *Spirulina*. It is well known that dendritic cells play an important role in immunoreaction. The results of using varying concentrations of the claimed composition as a dendrite-like cell-activating composition are disclosed at pages 15-18 of the Specification. Specifically, the Specification discloses that the claimed composition can induce CD34⁺ hemopoietic stem/ancestor cell differentiation into dendritic cells.

8. *Conclusion*

With respect to the Examiner's § 112 rejection that the Specification does not disclose specific dosages to support the claimed treatment regimes, Applicants respectfully assert that the above experimental results disclose sufficient information about the concentrations or ranges of amounts of the claimed composition that can be used for the claimed treatment regimes. However, one of ordinary skill in the art should recognize that the therapeutic effective amount will vary depending on the forms of therapeutic agents, the mode of administration, the patient's physical characteristics, and the severity of the disease. Because the claimed composition have not exhibited any side effects on human patients (see Specification at pg. 2), a person of ordinary skill in the art would also appreciate

that it is of little value to specifically define the upper and lower limits of the therapeutically effective amounts.

With respect to the Examiner's assertion that the Specification does not disclose specific disease conditions that can be treated by the claimed treatment regimes, Applicants respectfully assert that above results clearly show the effectiveness of the claimed composition against various ailments which are known to harmful effects *in vitro*. Therefore, it is not necessary to define the specific diseases resulting from such ailments.

Accordingly, Applicants respectfully assert that the treatment regimes disclosed in claims 1-49, as amended, are sufficiently supported by the Specification to satisfy the written description and enablement requirements. In addition, Applicants assert that new claims 57-63, which do not claim specific treatment regimes or therapeutically effective amounts, satisfy the written description and enablement requirements.

B. Clam Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-56 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 1-56 have been amended in accordance with the Examiner's remarks and are believed to satisfy the definiteness requirement of 35 U.S.C. § 112, second paragraph.

C. Claim Rejections Under 35 U.S.C. § 102(b)/103(a)

Claims 1-56 are rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,585,365 (Hayashi et al.) Applicants respectfully traverse these rejections since Hayashi fails to disclose or suggest a proteoglycan extract from *Spirulina* and all of the treatment regimes disclosed in the present claims.

Hayashi discloses a *Spirulina* polysaccharide extract (see Hayashi at col. 1, lines 1-7 and lines 29-31, col. 4, lines 1-26) that is subject to a protein precipitating agent to precipitate and remove proteins in the *Spirulina* polysaccharide extract to obtain a protein-free extract (see Hayashi at col. 2, lines 44-54). An aqueous solution of the protein-free *Spirulina* polysaccharide extract of Hayashi is further subjected to a purification process such as column chromatography to select fractions showing a single peak at 480 nm in phenol sulfuric acid (see Hayashi at col. 2, lines 56-64).

Thus, the protein-free *Spirulina* polysaccharide extract disclosed in Hayashi is a completely different composition from the *Spirulina* proteoglycan extract of the claimed invention, since proteoglycan extracts necessarily consist of a complex of protein and polysaccharide. See attached English Translation Abstract of

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“Experiment Report of the Research Regarding the Components in the Proteoglycan Composition,” Shanghai Institute of Materia Medica, China Science Academy.

The proteoglycan extract from *Spirulina* of the present invention also differs from Hayashi in its treatment regimes. Hayashi only discloses antiviral activities of the protein-free *Spirulina* polysaccharide extract. However, as stated above and described in the Specification, the presently claimed composition has several useful activities, including, but not limited to, antiviral activity, tumor inhibitory effect, anti-irradiation function, hemogram-improving activity, DNA-repairing activity, and immunoenhancing activity.

Therefore, Applicants respectfully assert that claims 1-56, as amended, and new claims 57-62 cannot be anticipated by, or obvious over, Hayashi since Hayashi teaches away from the claimed invention.

D. Claim Rejections Under 35 U.S.C. § 103(a)

Claims 50 and 56 are rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,585,365 (Hayashi et al.). As set forth above, Hayashi expressly requires that after an aqueous solution of a protein-free *Spirulina* polysaccharide extract is obtained, the extract is subjected to a purification process such as column chromatography to select fractions showing a single peak at 480 nm in phenol sulfuric acid (see Hayashi at col. 2, lines 44-64). Claims 50 and 56 of the present

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invention differ from Hayashi, not only because they claim a proteoglycan extract, but also because further purification after step d) is not required.

In addition, Hayashi does not disclose adjusting the filtrate to pH 7 as recited in step d) of claim 50, or adjusting the liquid phase to a pH of 3.8-4.2. Moreover, Hayashi specifically utilizes 10% trichloroacetic acid as a protein precipitating agent rather than a pH adjuster. Thus, a person skilled in the art would not recognize the step of adjusting the pH of the liquid phase as disclosed in claims 50 and 56 as being obvious over the protein-precipitating step disclosed in Hayashi.

For the above reasons, Applicant respectfully submits that the presently claimed invention is patentable over the prior art. Reconsideration and allowance of the claims is respectfully requested.

Respectfully submitted,

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